Arash Dehghan

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EDUCATION

Toronto Metropolitan University — Toronto, Ontario
Ph.D. Candidate, Operations Research — Jun. 2024
Advisor: Mucahit Cevik, Merve Bodur [University of Toronto]
Dissertation: **ADP-based Approaches for Improved Delivery Operations**

Toronto Metropolitan University — Toronto, Ontario
M.Sc., Applied Mathematics — Aug. 2021
Advisor: Pawel Pralat
Thesis: **Embedding Complex Networks** [Thesis | Code]

Wilfrid Laurier University — Waterloo, Ontario
B.Sc., Pure Mathematics — Aug. 2018
Advisor: Angele Hamel
Thesis: **Simplified Blockchain** [Thesis | Code]

RESEARCH EXPERIENCE

Toronto Metropolitan University — Toronto, Ontario
Graduate Research Assistant, Mechanical and Industrial Engineering — Sept. 2019 – Present

- Research extensively in machine learning and reinforcement learning, covering dynamic programming, stochastic optimization, and embeddings.
- Conduct reinforcement learning, prioritizing model selection and hyperparameter tuning.
- Implement algorithms using TensorFlow, PyTorch, and Keras for practical applications.
- Develop optimization models using CPLEX for linear and integer linear programming challenges.
- Publish and present on node embeddings, dynamic programming, and deep reinforcement learning.
- Automate simulations and run them on Google Cloud and Compute Canada Servers.
- Train peers in software tools such as Python, R, SQL, VBA, SAS, MATLAB, MongoDB & Tableau.

Wilfrid Laurier University — Waterloo, Ontario
Research Assistant, Mathematics — Aug. 2018 – Aug. 2019

- Conduct comprehensive literature reviews to understand the current state-of-the-art and identify gaps.
- Develop and refine mathematical models in the domain of game theory.
- Implement algorithms and simulations to test, validate, and iterate on models.
- Contribute to writing of research papers in peer-reviewed journals.
- Collaborate closely with peers, professors, and interdisciplinary teams to drive research objectives.

JOURNAL PUBLICATIONS AND PREPRINTS

[J1] **A.Dehghan**, B.Kaminski, B.Krainski, P.Pralat, and F.Theberge, "Evaluating Node Embeddings of Complex Networks", **Journal of Complex Networks**, (2022) [URL | Code]

[P1] **A.Dehghan**, M.Cevik, and M.Bodur, "An Enhanced Approximate Dynamic Programming Approach to On-demand Ride Pooling", (2023) [Link | Code]

[P2] **A.Dehghan**, M.Cevik, and M.Bodur, "Neural Approximate Dynamic Programming for the Ultra-fast Delivery Problem", (2023) [Link | Code]

TEACHING EXPERIENCE

Toronto Metropolitan University Toronto, Ontario

Graduate Teaching Assistant, Mathematics & Industrial Engineering Sept. 2019 - Present

- Led weekly lecture sessions with 40-50 students, effectively breaking down complex topics to ensure student comprehension
- Designed and delivered interactive lesson plans, adapting to student feedback and academic needs
- Held regular office hours to provide one-on-one or group tutoring, addressing individual questions and academic challenges
- Coordinated with lead professor to ensure consistency in curriculum delivery and to integrate supplemental materials
- Evaluated and graded student assignments, exams, and projects, providing constructive feedback to enhance learning outcomes
- Courses TAed:
    - MTH140 – Calculus I (Lead TA)
    - MTH141 – Linear Algebra
    - MTH240 – Calculus II
    - MTH314 – Discrete Mathematics
    - MTH430 – Differential Equations (Lead TA)
    - IND405 – Introduction to Data Analysis & Analytics (Lead TA)
    - CIND119 – Introduction to Big Data
    - CIND123 – Data Analytics: Basic Methods

CONFERENCE TALKS & PRESENTATIONS

1. *Neural Approximate Dynamic Programming for the Ultra-fast Delivery Problem*, CORS Optimization Days, HEC Montreal, May 2023.
2. *Evaluating Node Embeddings of Complex Networks*, Networks 2021, Indiana University, July 2021.

GRANTS & AWARDS

- *Equity & Inclusion Teaching Award ($1,000)* *[2023]*
- *Queen Elizabeth II Graduate Scholarship ($15,000)* *[2021-2022]*
- *Ontario Graduate Fellowship ($12,000)* *[2019-2020]*
- *MITACS Research Award ($6,000)* *[2019-2020]*
- *Mathematics Graduate Award ($1,000)* *[2019-2020]*

PROFESSIONAL EXPERIENCE

HubHead Toronto, Ontario

Senior Machine Learning Engineer Aug. 2023 – Present

- Developed machine learning models for various NLP tasks: text classification, sentiment analysis & named entity recognition.
- Trained and deployed various embedding algorithms such as Word2Vec, Node2Vec, and DeepWalk.
- Conducted data pre-processing, cleaning, and feature engineering for text preparation.
- Designed and executed experiments to fine-tune model hyperparameters and optimize model performance.
- Developed machine learning and data pipelines & implemented GUI applications for organization-wide use.
- Translate complex machine learning and NLP concepts and results in a simple and concise manner.

5REDO Waterloo, Ontario
Machine Learning Engineer Feb. 2023 – Jul. 2023

- Led the design and implementation of reinforcement learning algorithms for complex tasks, such as DQN and DDQN.
- Collaborated closely with cross-functional teams to define RL problem statements, requirements, and objectives.
- Conducted in-depth analysis of available data sources and integrated relevant data streams into RL pipelines.
- Managed the end-to-end RL development: formulation, pre-processing, algorithm selection, training, evaluation, deployment.
- Evaluated RL agents' performance via simulations and real-world testing, iteratively improving models via experimentation.

TECHNICAL SKILLS

- Strong working knowledge of: Python, Julia, R
- Experience working with: SQL, VBA, SAS, Tableau, MongoDB, MATLAB, LaTeX
- Experience with machine learning and optimization libraries: TensorFlow, Keras, PyTorch, CPLEX
- Data manipulation, analytics, and visualization libraries: Pandas, Numpy, Plotly, Matplotlib, SciPy
- Reinforcement learning: Markov Decision Processes, Dynamic Programming, Deep Learning
- Proficient in utilizing node embedding algorithms: Node2Vec, DeepWalk, LINE, SDNE
- Mathematical & problem-solving skills: Calculus, Linear Algebra, Differential Equations, Statistics
- Experience in using Microsoft Productivity Tools: Word, Excel, PowerPoint
- Working knowledge of software revision control systems such as GIT
- Familiar and comfortable with using Linux, Windows, and Mac OS X platforms.
- Native languages spoken: English, Farsi
- Skilled in data cleaning and preparation for machine learning and reinforcement learning pipelines.
- Extensive experience testing, debugging, and maintaining large-scale computer programs.
- Exceptional writing ability as demonstrated through successful publication of scientific papers.
- Outstanding communication and public speaking skills.